MUCK VEGETABLE GROWERS:

Diffusion of Innovations Among Specialized Farmers

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CONTENTS

MUCK VEGETABLE GROWERS: DIFFUSION OF INNOVATIONS AMONG SPECIALIZED FARMERS

by

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SUMMARY

Muck vegetable growers are highly specialized farmers who reside on former lake beds where the water has receded or been drained, leaving behind a dark peat-like soil. These farmers raise such crops as onions, carrots, parsley, radishes, celery, potatoes, spinach, and lettuce.

Purpose of the present study is to determine the role of the Ohio Agricultural Experiment Sub-Station Farm in the adoption of innovations by muck vegetable growers. Data were gathered from 44 of the 49 muck vegetable farms in Ohio in 1959, which were operated by 61 muck growers. The respondents lived in 10 Northern Ohio counties; most were concentrated in Huron, Stark or Summit Counties.

1. Muck farmers are highly research-oriented and make frequent trips to Experiment Stations, neighboring farms, and out-of-state farms to observe muck farming innovations. Muck growers can generally be characterized by more education, employing more labor, younger of age, and more cosmopolite travel than the average commercial farmer in Ohio.

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2. The characteristics of adopter categories in the present study indicate that innovators have more education, larger farms, more cosmopolite travel, and closer geographical distance from the Sub-Station Farm than laggards. Innovators also have more direct contact with scientists than laggards, and are more likely to be named as opinion leaders by their fellow muck growers.

3. Opinion leaders are persons looked to by other individuals as sources of information and advice. Opinion leaders in the present study were characterized by larger farms, more educatinn, more contact with agricultural scientists, more cosmopolite travel, closer proximity to the Sub-Station Farm, greater attendance at the Muck Crops School, and earlier adoption of muck farming innovations. Growers sought information from other growers who were earlier than themselves to adopt muck farming innovations.

4. The effectiveness of the Sub-Station Farm located near Willard, Ohio is indicated by the number of growers having information-contact with this facility. Growers are generally well satisfied with their investment in the Sub-Station and feel it has done much to help them.

5. Muck growers are generally more optimistic about the future of farming than is the average commercial farmer in Ohio.

INTRODUCTION

Background of the Study

The Ohio Agricultural Experiment Sub-Station Farm near Willard, Ohio, is devoted entirely to research on muck vegetable crops and muck soils. It was established in 1948 on land donated by muck growers who had experienced disease, insect, and other problems with their muck vegetables. Research funds and personnel for operation of the Sub-Station Farm are provided by the Ohio Agricultural Experiment Station.

The present study was originally initiated in 1959 by administrators of the Ohio Agricultural Experiment Station in order to determine the role of the Sub-Station Farm in the adoption and diffusion of innovations by muck vegetable growers. The preliminary results of this study were presented at the 1960 Muck Crops School at Celeryville, Ohio. The present report is intended to supplement this oral presentation and report additional findings from further analysis of the data.

How The Study Was Done

The research design for the present study called for data from all the muck vegetable growers in Ohio. A muck vegetable grower was defined as someone raising vegetables such as onions, celery, radishes, potatoes, carrots, spinach, parsley, or lettuce on muck soils. The names of growers meeting this definition were obtained from the manager of the Sub-Station Farm, from an Extension Specialist in Horticulture, and from individual muck growers.

Data for the present report came from 44 of the 49 muck vegetable farms in Ohio in 1959. Operators of five muck vegetable farms could not be contacted by mailed questionnaire or by three personal visits. The response rate of almost 90 percent indicated a general attitude of cooperation by the respondents.

The 44 muck vegetable farms included in the present study are operated by 61 farmers because several partnerships, father-son arrangement and owner-manager combinations were encountered. Certain of the findings in the present report concern the 44 farms; other findings concern the 61 farmers.

Importance Of The Study

There are three major reasons for the importance of the present study.

1. Although over 135 research studies have been completed by rural sociologists on the diffusion and adoption of farm innovations, a search of the

literature disclosed the present study was the first to investigate the diffusion of innovations from a specific research facility (in this case, the Sub-Station Farm) to farmers. Because a time period of several years has generally been found between the release of an innovation and its widespread adoption by farmers, an eventual goal of the present research is to speed up the diffusion process. The results of scientific investigation in agriculture are of little utility until these results are utilized by farmers.

2. Although muck farmers are small in number in Ohio, their relative importance is suggested by the value of crops grown and the number of workers employed. Muck growers raise a sizeable portion of Ohio's celery, radishes, carrots, potatoes, and onions. In Ohio about 6,800 acres of muck vegetable crops were cultivated in 1959. Many additional acres of muck soils in Ohio were planted to corn, soybeans, or other "upland crops."

Since muck vegetable farming is very intensive in nature, little acreage is required for a large enterprise. The average muck farmer has about 200 acres of muck soil, and if the four farms of over 500 acres are eliminated, this figure is 113 acres. However, each muck farm provides employment for an average of about 33 workers during the growing season.

3. Another reason for the present study is the importance of studying highly specialized farmers. There is a long-range trend toward increasing specialization of American agriculture as a result of new farm technology. Specialization will have important consequences for county Extension agents, teachers, agricultural salesmen and dealers, and others. Past research by rural sociologists has suggested that the communication behavior of specialized farmers is much different from that of relatively less specialized farmers. For example, the specialized

farmer is more likely to travel directly to agricultural scientists for advice and information. The local county agent or farm dealer, who must attempt to keep up to date on all types of farming, is less likely to be utilized by the specialized hog farmer, dairyman, poultry producer, or fruit grower.

The respondents in the present study are very highly specialized. In fact, it is probably difficult to find a more specialized category of farmers in Ohio at the present time, unless it might be the greenhouse vegetable growers. Many of the growers in the present study raised nothing but muck vegetables. However, some grew corn, soybeans, or sweet corn on their farms. Few had any livestock. If the trend toward increasing farm specialization continues, the present study of muck vegetable growers should have added significance. Throughout this report, many comparisons will be made to a state-wide sample of 104 commercial farmers who were interviewed in 1957. This provides a contrast between specialized farmers and more general farmers.

Past Research

A review of literature disclosed little past research by rural sociologists on muck vegetable farmers. A classic study in the tradition of research on the diffusion of farm innovations was by Hoffer in 1942.[2] The purpose of Hoffer's study was to determine the need for Experiment Station bulletins in the Dutch language for Michigan celery growers. Agricultural scientists in Michigan in 1940 were aware that the Dutch celery growers were reluctant to adopt innovations,

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[2] Charles R. Hoffer, Acceptance of Approved Farming Practices Among Farmers of Dutch Descent, East Lansing, Michigan Agricultural Experiment Station Special Bulletin 316, 1942.

even when it meant saving the celery crop from blight and other diseases. After interviewing 289 Dutch celery growers, Hoffer concluded that, "Unless a practice can meet the need of immediate practicability, it may not be used though its value eventually cannot be questioned." The attitudes and values of Ohio muck vegetable growers are certainly more progressive than those existant in Michigan 20 years earlier.

Locale Of The Study

Most of the 49 muck vegetable farms are located in three Northern Ohio counties: Stark, Huron, and Summit. Seven other Ohio counties have one, two, or three muck vegetable farms. The location of muck vegetable farms is shown in Figure 1 and the location of muck vegetable acreage in Ohio is shown in Figure 2.

Celeryville Community

Twenty-eight (46 percent) of the 61 growers and about 25 percent of the acreage in muck vegetables in Ohio are located in Huron County near Celeryville, Ohio. Celeryville is unique in its form of community settlement; few of the muck vegetable growers reside on their farms. Their homes are located mainly in the village of Celeryville.

At one time the Celeryville community contained a large number of five acre farms, each of which provided employment for one family. As a result of mechanization and other changes, the typical muck vegetable farm today is much larger. Large amounts of hand labor are required on muck vegetable farms; this is particularly true on the few remaining small farms where the advantages of mechanization are not entirely applicable. For example, one 16 acre muck farm provided work for three adults and eight children in 1959 for nine months of the year. On the larger farms, much of the family labor has been replaced by mechanization and by hired

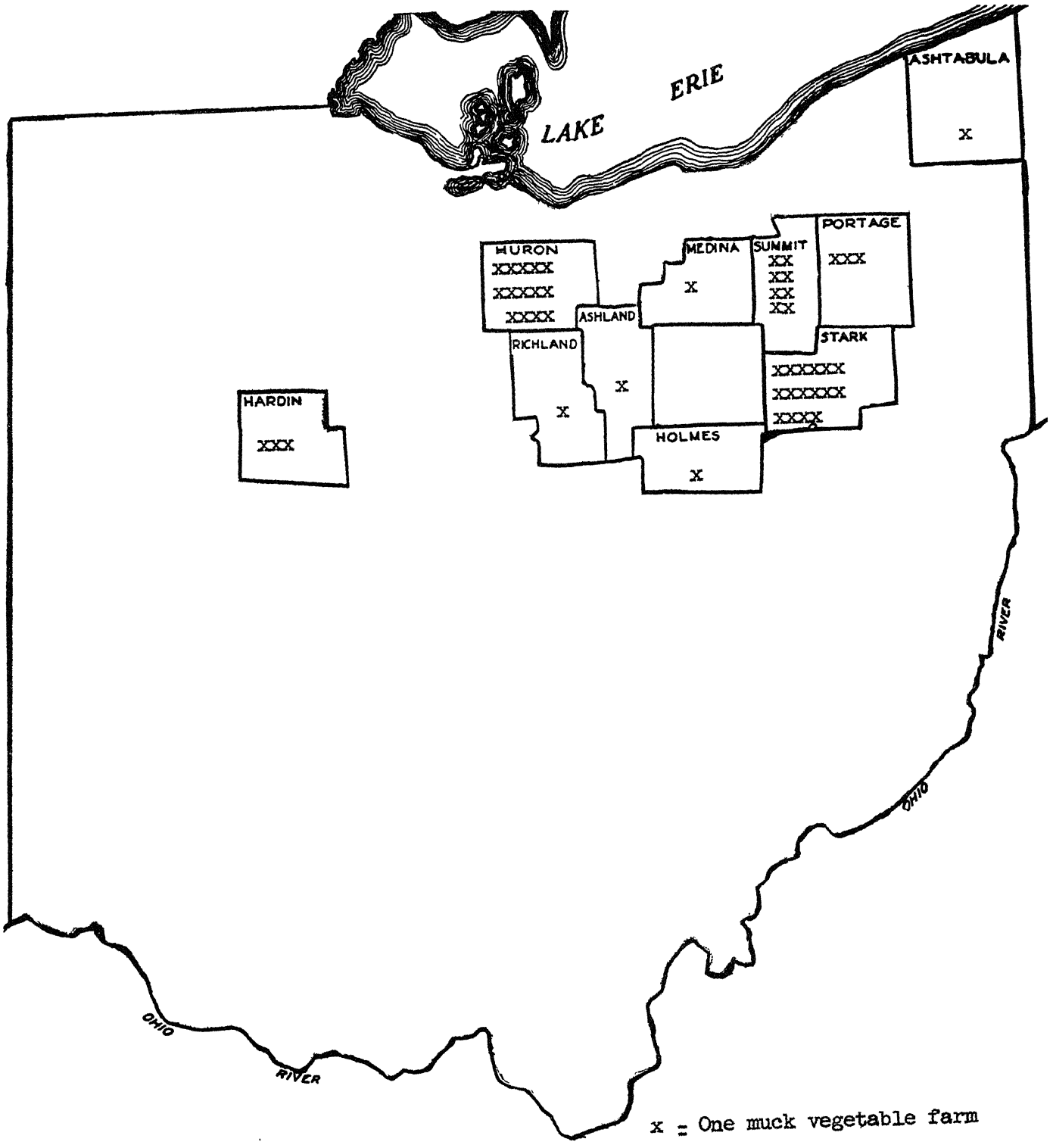

Figure 1. Location of 49 Muck Vegetable Farms in Ohio in 1959

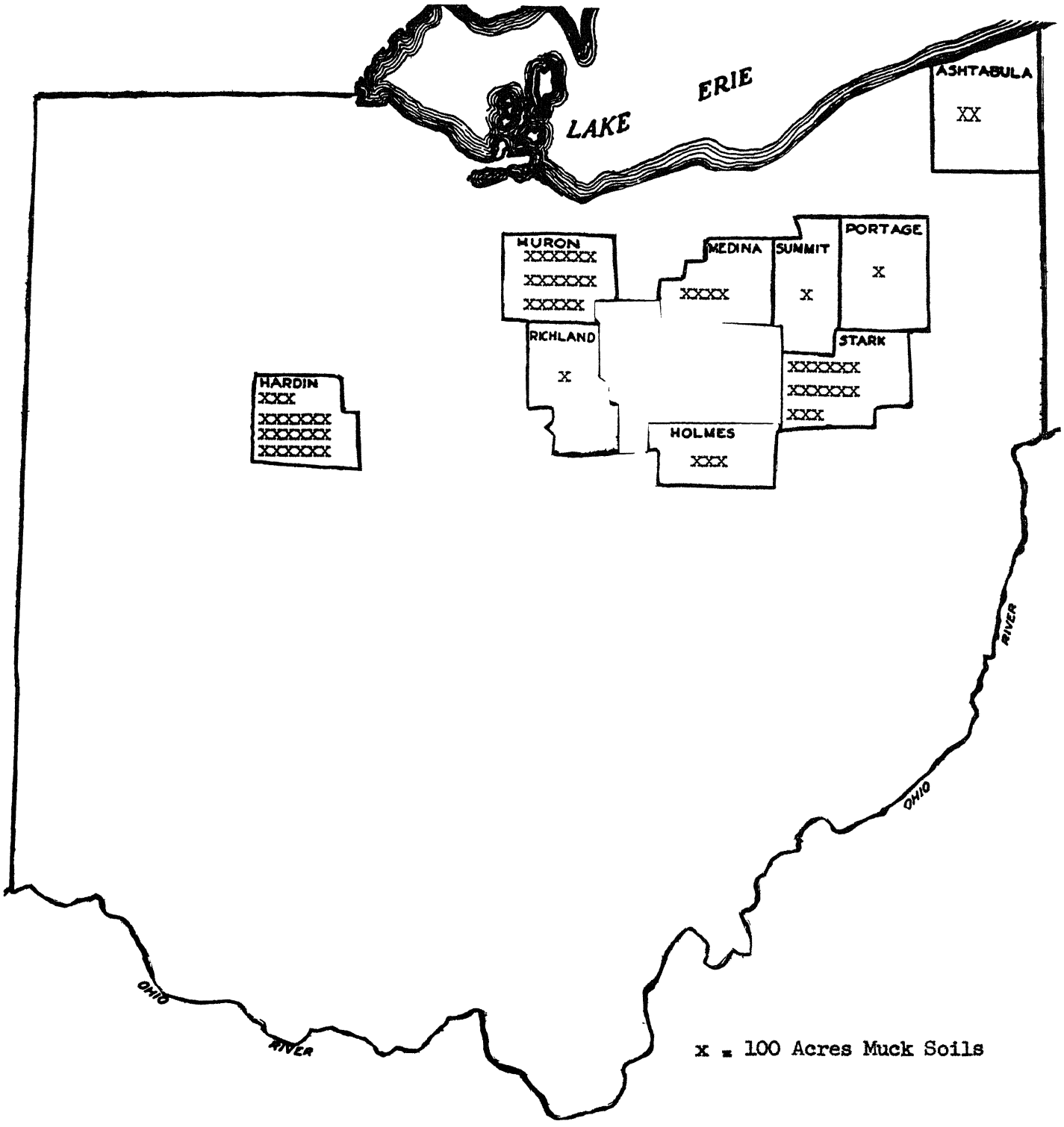

Figure 2. Location of Muck Vegetable Acreage in Ohio in 1959

laborers who are often migratory workers from Texas, Mexico, and the South.

In mid-November, when the work season nears completion, many growers travel to Sarasota, Florida, for a few months' vacation. Some Ohio growers raise vegetable crops in Florida during the winter season.

Most of the growers in the Celeryville community are from Dutch extraction. There is a great deal of community spirit; in many respects the area is somewhat typical of the small rural community once common throughout the United States. The Christian Reformed Church is an importart influence in the Celeryville community. No farm work is done on Saturday afternoon or Sunday.

Hartville Community

Fifteen (25 percent) of the 61 growers and about 25 percent of the acreage in muck vegetables in Ohio is located in Stark County near Hartville, Ohio. The Hartville community is similar to Celeryville, in that its importance for muck vegetable farming is due to a former lake bed that was drained to leave a thick layer of fertile muck soil. In many other respects, however, the Hartville community is much different than Celeryville.

The people are less likely to be of Dutch descent; they possess few of the other ethnic characteristics typical of Celeryville growers. Many of the Hartville growers reside on their farms. There is no one village center containing the residences of most of the growers, as in Celeryville. The close-knit community feeling found at Celeryville is less characteristic in the Hartville area.

Other Muck Farming Communities

The remaining 18 muck vegetable growers and about half of the acreage in muck vegetables are at scattered locations throughout Northern Ohio. Two or three growers are sometimes located on adjacent farms where muck soils result

from a former lake bed.

PERSONAL CHARACTERISTICS OF GROWERS

Age

The average age for muck vegetable growers is 46 years which is five years less than the average age of commercial Ohio farmers (Figure 3). The younger age of muck vegetable growers may be due to at least two factors: (1) more young farmers enter muck vegetable growing, or (2) older muck vegetable growers retire at a younger age than do other Ohio farmers. The younger age of muck vegetable growers has important implications for the adoption of new farm practices. Past research has generally indicated that early adoption of new practices is more likely for younger farmers.

Education

The average number of years of formal education completed by commercial farmers in Ohio is about eight grades. The average for muck farmers is several years of high school. Over 63 percent of the muck vegetable farmers had completed high school. Specialized farmers tend to have more education than the average farmer (Figure 4).

Farm Size

The average number of acres per farm in Ohio was about 113 in 1955. This figure includes nurserys, residential farms, and part-time farmers. The average muck vegetable farm is about 200 acres. These specialized farmers utilize their land intensively. In fact, many growers harvest two or three plantings of vegetable crops per season.

Farm size can be measured not only in acres, but also in terms of labor requirements. Muck vegetable farms require much more labor than other commercial Ohio

farms of similar acreage. The muck vegetable farm in the present study employed an average of 32.8 workers per farm. Of this number, 3.3 were family members and 29.5 were non-family employees. The total labor requirements on the 44 muck vegetable farms in the present study during 1959 were about 1,438 workers.[3] The average commercial farm in Ohio employed about 0.25 non-family workers in 1955.

Cosmopoliteness

Past research has suggested that specialized farmers travel widely to observe new practices in operation on other farms. It was expected that more specialized farmers would tend to be more cosmopolite, that is, oriented outside of rather than inside of their communities, than would more general farmers.

One indication of the cosmopoliteness of the muck vegetable growers is the extent to which they had traveled outside of their county within the past year to observe new ideas in muck crop farming. Almost half (48 percent) said they had done so. The most frequent location visited was (1) Florida, and (2) other growers in Ohio. This wide travel was less characteristic of growers living near Celeryville, Ohio than of growers living elsewhere in the state.

The growers were also asked whether they had traveled to Florida within the past year. Forty-four percent had done so. Most reported that they traveled to Florida for a vacation, several growers indicated they raised muck vegetable crops in Florida during the winter season.

Other evidence of the cosmopoliteness of the present respondents is contained in later sections on attendance at the annual Muck Crops School and visits to the Muck Crops Sub-Station Farm.

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[3] It should be pointed out that few of these employees worked on a year-around basis. Many workers were only hired during seasonal labor peaks.

Muck vegetable growing requires large amounts of hand labor both in the field and in the packing shed. The muck grower's family provide an important part of this labor.

COMMUNICATION BEHAVIOR

A purpose of the present study was to determine the way in which muck farming innovations diffuse from agricultural scientists to growers. Findings as to the growers' sources of information, contact with scientists, and communication with their neighbors about muck vegetable innovations are included in this section.

Sources of Information

Respondents in the present study were asked to specify their most important source of new information about muck crops. Sources named were visits to the Muck Crops Sub-Station Farm and the annual Muck Crops School. The information sources for muck vegetable growers are compared to those of a state-wide sample of commercial Ohio farmers in Figure 5.

Compared to less specialized farmers in Ohio, muck vegetable growers have more direct contact with scientists and their experiments. Specialized farmers are less likely to utilize such general sources of new farm information as the Extension Service or farm magazines.

Contact With Sub-Station Farm

The respondents in the present study were asked whether they had visited the Muck Crops Sub-Station Farm within the past year. Fifty-four percent of the muck vegetable growers had visited the Sub-Station during 1959. Muck vegetable growers were much more likely to have direct contact with agricultural scientists than were other commercial Ohio farmers (Figure 6).

Growers who lived in the vicinity of the Muck Crops Sub-Station Farm near Celeryville were much more likely to visit it than were growers living in other counties. The growers reported they visited the Sub-Station Farm mainly to secure

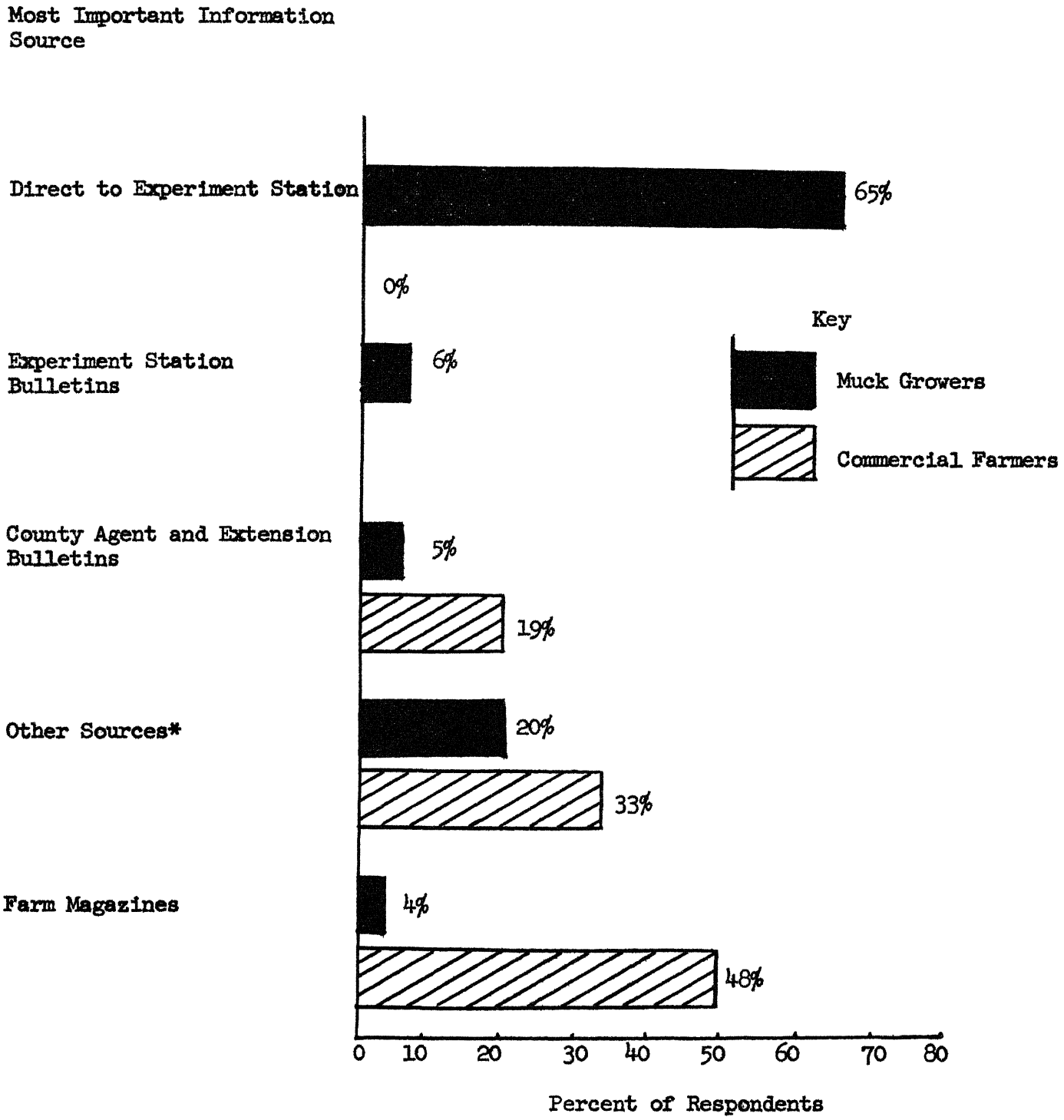

Figure 5. Most Important Sources of Information for Muck Vegetable Growers and Commercial Farmers

*Other sources include family or relatives, friends and neighbors, radio and TV farm shows, VoAg teachers, and others.

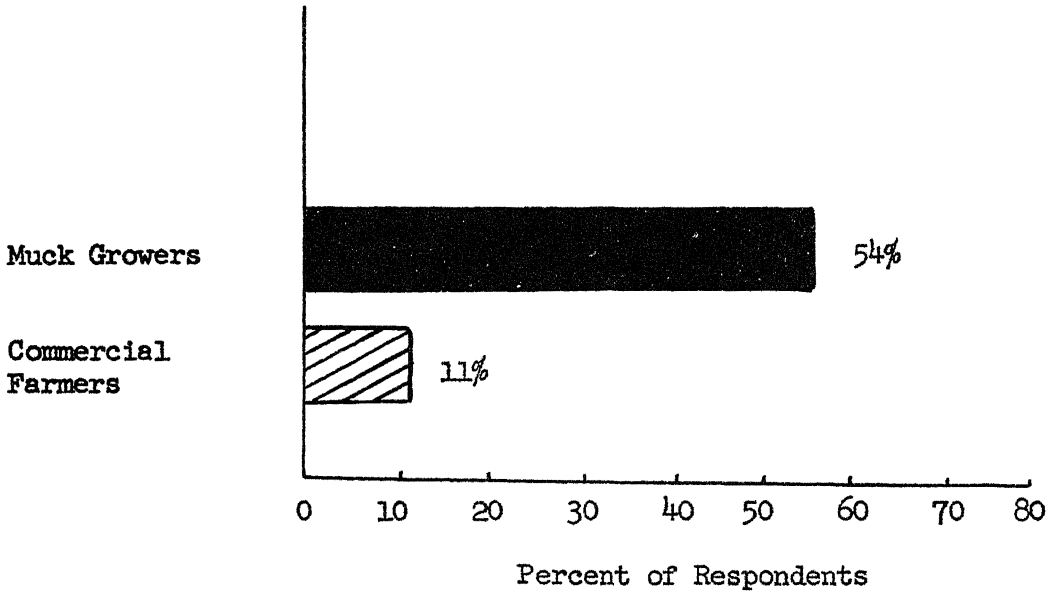

Figure 6. Percent of Muck Vegetable Growers and Commercial Farmers Having Direct Contact with Agricultural Scientists in Past Year

advice about the growing of muck crops and to observe new methods being studied and demonstrated.

Attendance at Muck Crops School

The respondents were asked whether they had attended the 1958 or the 1959 Muck Crops School at Celeryville, Ohio. This two-day event features speeches and discussion by research workers on muck vegetable problems. Over half (51 percent) of the growers attended the School in the past year. Growers who live near Celeryville are more likely to attend the Muck Crops School than are those who reside in other counties.

ADOPTER CATEGORIES

One of the useful dimensions of analysis in the present investigation is that of adopter categories. It is obvious that all farmers do not adopt innovations at the same point in time. The first farmers to adopt new ideas are called innovators. Other adopter categories, in order of their relative time of adoption, are early adopter, early majority, late majority, and laggards.

Classification Method

In the present study, growers were classified into the five adopter categories on the basis of their scores on an adoption-of-muck-innovations scale. This scale consisted of 14 recent muck vegetable practices recommended by scientists at the Ohio Agricultural Experiment Station.[4] A grower's adoption score was computed so

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[4] The 14 practices included in the adoption scale are: (1) spray for onion thrips, (2) use 2, 4-D weed spray on potatoes; (3) intercrop vegetables with green-manure crops; (4) apply plant nutrients by foliar application; (5) use maleic hydrazide to inhibit sprouting of onions or potatoes; (6) fumigate soil for nematodes; (7) plant hybrid onion varieties; (8) plant Utah 52-70 on Utah 52-70H celery varieties; (9) use phosdrin insecticide for aphids on radishes; (10) spray with chlora IPC for pre-emergent weed control on onions or spinach; (11) spray with carrot oil for weed control in carrots; (12) use fungicides for blight on celery, onions, or potatoes; (13) use systemic fungicides; (14) apply trace elements.

as to give more points for earlier adoption of each innovation. Practices that did not apply to a grower's operation were not used in computing that individual's score. Utilizing a method described in more detail elsewhere by Rogers,[5] the 44 muck farmers[6] were classified as to adopter categories as shown in Table 1.[7]

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[5]Everett M. Rogers, "Categorizing the Adopters of Agricultural Practices," Rural Sociology, 23:345-354, 1958; and Characteristics of Agricultural Innovators and Other Adopter Categories, Wooster, Ohio Agricultural Experiment Station Research Bulletin, (in press).

[6]The adoption-of-muck-innovations scale items are computed for each of the 44 muck farms; obviously, these scale items are also a function of the 61 muck growers operating these 44 farms.

[7]In the present study it was possible to document the validity of adopter categorization. A professional who worked closely with the 44 muck farms in our sample was asked to subjectively rate each farm on a scale from one to five indicating a tendency to innovate muck farming innovations. Intraclass correlation between adoption scores and the judge's ratings is +.44, and Robinson's A is .61, both of which are significant at the one percent level.

Table 1. Classification of Muck Vegetable Growers in Adopter Categories

Adopter Category	Percentage of Adopters Ideally Included in Category	Number of Growers in Category	Adoption Score Limits
Innovators	2½%	1	Over 6.00
Early Adopters	13½%	6	5.5 to 6.00
Early Majority	34%	15	4.37 to 5.50
Late Majority	34%	15	3.60 to 4.35
Laggards	16%	7	Less than 3.50
Total	100%	44	

Past research by rural sociologists with farmers has indicated wide differences in characteristics and communication behavior on the basis of adopter category. For example, past studies have generally shown innovators are younger, more highly educated, more cosmopolite, more financially successful, and possess more scientific attitudes than do laggards. Do these differences exist among the adopter categories in the case of muck growers?

Characteristics

The characteristics of adopter categories are summarized in Table 2. Innovators[8] and laggards are oldest; early majority are youngest. This trend is not consistent with past research on innovators; they have been found to be younger than other categories.

Education decreases from innovators to laggards, as does farm size in acres and total amount of labor per farm. Cosmopoliteness of travel to observe farm

[8] The reader should generally be very cautious in interpreting characteristics of the innovator category which only includes a single case.

innovations decreases consistently from innovators to laggards. Travel to Florida is most common among the late majority. Distance from Sub-Station Farm generally is greater for laggards than for innovators and early adopters.[9]

Table 2. Characteristics by Adopter Categories

Characteristics	Innovators	Early Adopters	Early Majority	Late Majority	Laggards	Total
Age	56	46	42	45	51	46
Years of education	14	10	11	10	8	10
Farm size in acres	800	336	250	113	47	200
Family workers per farm	0.0	3.7	3.3	3.4	3.0	3.3
Hired workers per farm	60.0	51.3	33.3	27.0	3.5	29.5
Traveled outside of county in past year to observe farm innovations	100%	64%	52%	45%	11%	48%
Traveled to Florida in past year	0	36%	53%	60%	11%	44%
Distance from Sub-Station Farm in miles	0	29	34	42	37	34

[9] One reason for this trend is that innovators and early adopters tended to be somewhat concentrated in the Celeryville community, however, the Celeryville community also contained laggards.

Communication Behavior

Differences among the adopter categories were also found on the basis of communication behavior, as is shown in Table 3. When contrasted with laggards, innovators were (1) more likely to name direct contact with the Experiment Station as their most important source of information, (2) more likely to visit the Sub-Station Farm in the past year, and (3) more often in attendance at the Muck Crops School. The composite picture of the innovator is a grower who actively seeks muck farming innovations; the laggard has little interest in the results of scientific research on muck vegetable growing.

Table 3. Communication Behavior by Adopter Categories

Communication Behavior	Adopter Categories					
	Innovators	Early Adopters	Early Majority	Late Majority	Laggards	Total
Direct contact with Experiment Station as most important source of information	100%	91%	68%	50%	44%	65%
Visited Sub-Station in past year	100%	73%	52%	45%	44%	54%
Attended Muck Crops School in past year	100%	46%	63%	45%	33%	51%
Named as source of information by four or more other growers	100%	16%	7%	0	0	7%

OPINION LEADERS

Past research by sociologists has indicated that among every audience, there are certain individuals who are particularly influential. These opinion leaders are

looked to by other individuals as sources of information and advice. In order to locate the opinion leaders among the muck vegetable growers, they were asked, "If you had some problem with one of your muck crops, to whom would you go for information or advice?"

One grower was named as an opinion leader by seven other growers, one grower by six others, one grower by four others, one grower by two others, and five growers by one other. Fifty-two of the 61 growers were named by no one as an opinion leader.

The three growers named by four or more other growers as a source of information or advice are arbitrarily defined as opinion leaders in the present study. These three growers play a very important role in diffusing information about muck farming innovations to their colleagues. When compared to other growers, the three opinion leaders were characterized by:

1. Much larger farms in terms of acres operated and number of employees.
2. More years of education
3. More frequent contact with agricultural scientists
4. Wider travel to observe muck farming innovations
5. Shorter distance (in miles) from Sub-Station Farm
6. More likely to attend Muck Crops School
7. Earlier adoption of muck farming innovations (Table 3)

Figure 7 presents a more detailed analysis of the growers naming others as opinion leaders. It can be seen that the three main opinion leaders are earlier than the average to adopt muck growing innovations. An early adopter was named as an opinion leader by seven other growers. Opinion leaders are also more likely to name the Experiment Station as their most important source of information about muck crops (Figure 7).

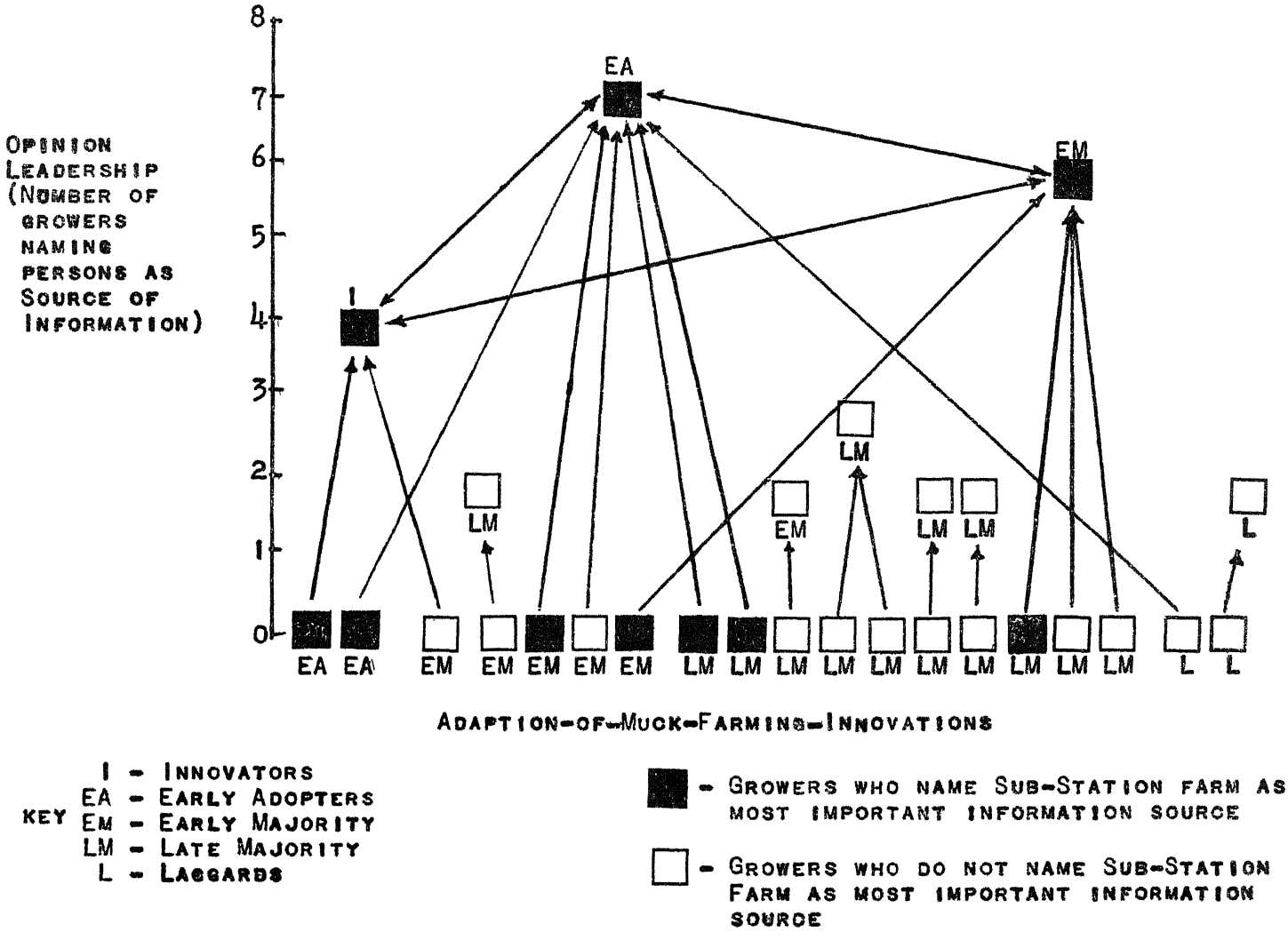

FIGURE 7. OPINION LEADERS ARE EARLIER TO ADAPT INNOVATIONS AND MORE LIKELY TO NAME SUB-STATION FARM AS MOST IMPORTANT SOURCE OF INFORMATION

* THIRTY-THREE OF THE RESPONDENTS DID NOT NAME ONE OF THE 60 OTHER RESPONDENTS IN THE PRESENT STUDY AS A SOURCE OF INFORMATION

There is a general tendency for "seekers" to name "soughts" who are relatively earlier to adopt innovations than themselves. Fourteen of the farmers in Figure 7 named a grower in an earlier adopter category than their own, six named a grower in the same adopter category, and four named a grower in a later adopter category (two of these cases are the innovator who must necessarily name someone in a later adopter category). Further detail on these information seeker-sought relationships is shown in Table 4.

It can be seen that the three major opinion leaders in Figure 7 constitute something of a "clique" in that they name each other as sources of information about muck vegetable growing. These three opinion leaders reside in the same community. In fact, there were relatively few occasions where a grower in one community named an opinion leader in another community.

Table 4. Information Seeker-Sought Relationships for Muck Vegetable Growers

Growers Seeking Opinion Leaders	Growers Sought as Opinion Leaders					
	Innovators	Early Adopters	Early Majority	Late Majority	Laggards	Total
Innovators	0	1	1	0	0	2
Early Adopters	2	0	1	0	0	3
Early Majority	2	2	1	1	0	6
Late Majority	0	2	4	4	0	10
Laggards	0	2	0	0	1	3
Total	4	7	7	5	1	24*

*It should be pointed out that the units of analysis in this table are the 24 seeker-sought relationships. Thirty-three of the respondents did not name any of the 60 other respondents in the present study as a source of information, and some respondents named more than one other grower as a source.

VALUE OF SUB-STATION FARM

Because the muck vegetable growers in Ohio helped finance the initial cost of the Muck Crops Sub-Station Farm, they were asked in the present study whether they felt the Farm had been worth this investment to them. Almost all of the respondents felt the Sub-Station had been a worthwhile investment. Typical comments are as follows:

> From /the Sub-Station Farm/ we get a lot of good information about new methods.
>
> Through their /scientists/ efforts, we got the present-day Utah celery varieties.
>
> We are all more keenly aware of our muck vegetable problems and have had much help toward their solution. Our progress has been much more rapid.
>
> Our farming methods have almost completely changed during recent years. The advice of Experiment Station specialists have made possible these changes. Examples are chemical weed control, and onion varieties.
>
> If it only helped one farmer, it would be worthwhile.

When compared to the average commercial farmer in Ohio, muck growers are probably more favorable toward agricultural research. This attitude is partly a result of the greater dependence of muck growers upon research as a solution to their disease, variety, weed and insect problems.

FUTURE OF MUCK VEGETABLE FARMING

The respondents were asked their opinion of the future of muck vegetable farming. The average commercial farmer is often pessimistic about the future of farming.[10] Muck vegetable growers are more optimistic about the future of farming than are other commercial farmers. Typical optimistic comments are as follows:

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[10]Evidence of this pessimism came from a study of 126 commercial farmers in two Western Ohio counties in 1958.

As the population of the nation increases, the demand for vegetables should increase, thereby making the future of muck farming a decent living, as it has been in the past.

I think muck growing has a bright future if we can only lick some of the disease problems.

Future looks good.

I think the farmer who follows modern methods has a good future in muck farming.

In spite of the general tenor of optimism about the future of muck farming, several respondents voiced future difficulties, particularly for the small-sized grower.

Tough future for the small growers.

It's going to be rough for the little fellow, I think.

The future is good only if the same amount of thought, effort, and cooperation is applied to marketing and sales as is now applied to production.

CONCLUSIONS

The present findings indicate that muck vegetable growers have novel characteristics; they are highly specialized, well-educated, younger, more cosmopolite in information-seeking behavior, more research-oriented, and farm more intensively than the average farmer. Muck growers are in much closer communication with agricultural scientists than is the average commercial farmer in Ohio. The ethnic-cultural characteristics of muck growers, particularly in the Celeryville community, help set them apart from the typical Ohio farmer.

One implication of these findings for such change agents or Extension agents and salespeople is that specialized farmers cannot be reached as effectively as the typical farmer with the usual approaches to diffusing innovations. The typical change agent is less of an "expert" to the specialized muck grower; there is a smaller educational

and "know how" gap between him and the specialized farmer. Many muck growers, in fact, have direct contact with agricultural scientists. The trend toward increasing specialization of American agriculture emphasizes the importance of the present findings.

The present investigation demonstrates that specialized farmers can be classified into adopter categories using techniques similar to those utilized with more general farmers. The characteristics of innovators and other adopter categories in the present study are generally similar to previous investigations with general farmers.

When the present findings are compared with the Hoffer study of Michigan muck growers twenty years previously, important differences are noted. The major distinction is that the modern muck grower in Ohio appears to be highly research-minded in contrast to his less scientific-oriented predecessor. A gradual breakdown of ethnic-differences between the Dutch grower and the rest of American society appears to be well underway.

Future research efforts might concentrate upon investigation of other types of highly specialized farmers (other than muck growers). The larger problem of diffusion of innovations from research facilities such as sub-station farms, merits future research effort. In fact, one such study is already planned for another Ohio Agricultural Experiment Sub-Station Farm.

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